WHAT IS CLAIMED IS:

1. A fabricating method of a semiconductor integrated circuit comprising forming a ruthenium electrode of a capacitor with high-k material on a semiconductor substrate by a chemical vapor deposition method in a sub-atmospheric pressure using an organoruthenium compound as a precursor, which includes:

a first step of providing the semiconductor substrate in a deposition chamber, increasing a temperature of the semiconductor substrate in the chamber up to a desired temperature;

a second step of supplying the precursor into the deposition chamber to form a ruthenium film with a desired thickness on the heated semiconductor substrate;

a third step of stopping the supply of the precursor and decreasing the temperature of the semiconductor substrate; and

supplying of an oxidation gas into the deposition chamber only during the precursor-supplying step.

2. The fabricating method of a semiconductor integrated circuit according to Claim 1, wherein the ruthenium electrode is a top electrode, and

the supply of an oxidation gas into the deposition chamber being carried out through all of the first, second, and third steps.

3. The fabricating method of a semiconductor integrated circuit according to claim 1, wherein the ruthenium electrode forming method further includes a step of

introducing a balance gas in addition to a carrier gas so as to keep a pressure in the deposition chamber constant through all of the other steps.

4. The fabricating method of a semiconductor integrated circuit according to claim 1, whereby the second step, the oxidation gas and an inert gas are supplied such that a oxygen partial pressure created by the oxidation gas in the deposition chamber is 0.1 Torr or less such that an amount of oxygen adsorption onto a surface of the semiconductor substrate is set to a minimum amount required for de-composing the precursor.

5. The fabricating method of a semiconductor integrated circuit according to claim 1, whereby the second step, the oxidation gas, an inert gas, and a solvent gas are supplied such that the oxygen partial pressure in the deposition chamber is 0.5 Torr or less such that the amount of oxygen adsorption onto the surface of the semiconductor substrate is set to a minimum amount required for de-composing the precursor.

6. The fabricating method of a semiconductor integrated circuit according to claim 1, whereby the second step the precursor of an organoruthenium compound is dissolved in a solvent as the precursor, and

wherein the ruthenium electrode forming method further includes a step of supplying the oxidation gas and an inert gas such that the oxygen partial pressure in the deposition chamber is 0.1 Torr or less thereby setting the amount of oxygen adsorption onto the surface of the semiconductor substrate to a minimum amount required for the decomposition of the precursor thereby increasing the amount of

oxygen adsorption onto the surface of the semiconductor substrate and shortening a growth time of the electrode.

7. The fabricating method of a semiconductor integrated circuit according to claim 1, whereby the second step a diluted precursor of an organoruthenium compound is dissolved in a solvent as the precursor, and

wherein the ruthenium electrode forming method further includes a step of supplying the oxidation gas, an inert gas, and a solvent gas such that the oxygen partial pressure in the deposition chamber is 0.5 Torr or less thereby setting the amount of oxygen adsorption onto the surface of the semiconductor substrate to a minimum amount required for the decomposition of the precursor thereby increasing the amount of oxygen adsorption onto the surface of the semiconductor substrate and shortening a growth time of the electrode.

8. The fabricating method of a semiconductor integrated circuit according to claim 1, wherein the second step further comprising a step of controlling the amount of oxygen adsorption onto the surface of the semiconductor substrate by the amount of a supplied vaporized solvent gas.

9. The fabricating method of a semiconductor integrated circuit according to claim 2, whereby the first step, the oxidation gas and an inert gas are supplied such that the oxygen partial pressure in the deposition chamber is 0.5 Torr or less thereby shortening a length of time between the start of the supply of the precursor and the start of deposition in the second step.

10. The fabricating method of a semiconductor integrated circuit according to claim 1, wherein the organoruthenium compound comprises at least one of bis-(cyclopentadienyl)ruthenium $[Ru(C_5H_5)_2]$, bis-(methylcyclopentadienyl)ruthenium $[Ru(CH_3C_5H_4)_2]$, bis-(ethylcyclopentadienyl)ruthenium $[Ru(C_2H_5C_5H_4)_2]$, tris-(dipivaloylmethanate)ruthenium $[Ru(C_{11}H_{19}O_2)_3]$, and $Ru(OD)_3$.

11. The fabricating method of a semiconductor integrated circuit according to claim 1, wherein the solvent for dissolving the organoruthenium compound comprises at least one of methanol, ethanol, 1-propanol, 2-propanol, isobutyl alcohol, 1-butanol, 2-butanol, diethyl ether, diisopropyl ether, octane, tetrahydrofuran, tetrahydropyran, 1,4-dioxane, acetone, methyl ethyl ketone, and toluene.

12. A fabricating method of a semiconductor integrated circuit comprising: forming a bottom electrode of ruthenium of a capacitor with high-k material on a semiconductor substrate by a chemical vapor deposition method in a sub-atmospheric pressure using an organoruthenium compound as a precursor, immediately thereafter performing annealing at not less than a formation temperature of the bottom electrode of ruthenium in an inert atmosphere or a reducing atmosphere thereby inhibiting deformation of crystal grains of the bottom electrode of ruthenium in the annealing step during or after capacitor insulator formation.

13. The fabricating method of a semiconductor integrated circuit according to claim 12, wherein the annealing temperature in the inert atmosphere or the reducing

atmosphere is not more than the annealing temperature for crystallization of the capacitor insulator.

14. The fabricating method of a semiconductor integrated circuit according to claim 12, wherein the temperature at which the deformation of crystal grains of the bottom electrode of ruthenium is inhibited is 800 °C or less.

15. The fabricating method of a semiconductor integrated circuit according to claim 12, wherein an average grain size of the crystal grains of the bottom electrode of ruthenium is 30 nm to 60 nm.

16. The fabricating method of a semiconductor integrated circuit according to claim 1, wherein the electrode of ruthenium of a capacitor with high-k material is formed on the semiconductor substrate, and immediately thereafter annealing is performed at not less than the formation temperature of the bottom electrode of ruthenium in an inert atmosphere or a reducing atmosphere thereby inhibiting deformation of crystal grains of the bottom electrode of ruthenium in the annealing step during or after capacitor insulator formation.

17. The fabricating method of a semiconductor integrated circuit according to claim 16, wherein said electrode is a bottom electrode.

18. The fabricating method of a semiconductor integrated circuit according to claim 1, wherein the oxidation gas comprises at least one of O_2, N_2O, H_2O, NO_2, and O_3.

19. The fabricating method of a semiconductor integrated circuit according to claim 4, wherein the inert gas comprises at least one of N_2, He, Ar, Ne, and Xe.

20. The fabricating method of a semiconductor integrated circuit according to claim 12, whereby the annealing step is performed at a temperature lower than a crystallization temperature of the high-k capacitor.